Science
Office of Science
Overview
Appropriation Summary by Program

(dollars in thousands)

	FY 2004 Comparable Appropriation	FY 2005 Original Appropriation	FY 2005 Adjustments	FY 2005 Comparable Appropriation	FY 2006 Request
Science					
Basic Energy Sciences	991,262	1,113,530	-8,898[a]	1,104,632	1,146,017
Advanced Scientific Computing Research	196,795	234,340	-1,872[a]	232,468	207,055
Biological and Environmental Research	624,048	586,590	-4,678[a]	581,912	455,688
(One-time projects)	(136,798)	(80,250)	(-642)	(79,608)	(0)
(Other Biological and Environmental Research)	(487,250)	(506,340)	(-4,036)	(502,304)	(455,688)
High Energy Physics	716,170	742,380	-5,936[a]	736,444	713,933
Nuclear Physics	379,792	408,040	-3,262[a]	404,778	370,741
Fusion Energy Sciences	255,859	276,110	-2,207[a]	273,903	290,550
Science Laboratories Infrastructure	55,266	42,336	-338[a]	41,998	40,105
Science Program Direction	150,277[b]	155,268	-1,562[ab]	153,706	162,725
Workforce Development for Teachers and Scientists	6,432	7,660	-61[a]	7,599	7,192
Safeguards and Security	62,328	73,315	-542[a]	72,773	74,317
Small Business Innovation Research/Small Business Technology Transfer	114,915[c]	0	0	0	0
Subtotal, Science	3,553,144	3,639,569	-29,356	3,610,213	3,468,323
Less use of prior year balances	-11,173	-5,062	0	-5,062	0
Less security charge for reimbursable work	-5,598	-5,605	0	-5,605	-5,605
Total, Science	3,536,373	3,628,902	-29,356	3,599,546	3,462,718
(Total, excluding one-time projects)	(3,399,575)	(3,548,652)	(-28,714)	(3,519,938)	(3,462,718)

Preface

The Office of Science (SC) requests $3,462,718,000 for the Fiscal Year (FY) 2006 Science appropriation, a decrease of $136,828,000 from the FY 2005 appropriation, for investments in basic research that are critical to the success of Department of Energy (DOE) missions in national security and energy security; advancement of the frontiers of knowledge in the physical sciences and areas of biological, environmental, and computational sciences; and provision of world-class research facilities for the Nation's science enterprise.

The FY 2006 SC budget request supports the ITER and hydrogen fuel Presidential initiatives as well as other Administration priorities such as nanotechnology and climate change science research. ITER is funded within Fusion Energy Sciences (FES); the Hydrogen Fuel Initiative within Basic Energy

[a] Includes a rescission in accordance with P.L. 108-447, the Consolidated Appropriations Act, 2005.
[b] Includes a reduction of $313,000 in FY 2004 and $325,000 in FY 2005 for a comparability adjustment for FY 2006 savings from the A-76 Financial Services competition that are transferred to Departmental Administration.
[c] Includes $76,220,000 reprogrammed within SC and $38,695,000 transferred from other DOE programs.

Sciences (BES); nanotechnology within BES and Advanced Scientific Computing Research (ASCR); and climate change research within Biological and Environmental Research (BER).

Within the Science appropriation, SC has ten programs: ASCR, BES, BER, FES, High Energy Physics (HEP), Nuclear Physics (NP), Safeguards and Security (S&S), Science Laboratories Infrastructure (SLI), Workforce Development for Teachers and Scientists (WDTS), and Science Program Direction (SCPD).

This Overview will describe Strategic Context, Mission, Benefits, Strategic Goals, and Funding by General Goal. These items together put the appropriation request in perspective. The Annual Performance Results and Targets, Means and Strategies, and Validation and Verification sections address how the goals will be achieved and how performance will be measured. Finally, this Overview will address the Research and Development (R&D) Investment Criteria, Program Assessment Rating Tool (PART), and Significant Program Shifts.

Strategic Context

Following publication of the Administration's National Energy Policy, the Department developed a Strategic Plan that defines its mission, four strategic goals for accomplishing that mission, and seven general goals to support the strategic goals. Each appropriation has developed quantifiable goals to support the general goals. Thus, the "goal cascade" is the following:

Department Mission → Strategic Goal (25 yrs) → General Goal (10–15 yrs) → Program Goal (GPRA Unit) (10–15 yrs)

To provide a concrete link between budget, performance, and reporting, the Department developed a "GPRA Unit" concept. Within DOE, a GPRA Unit defines a major activity or group of activities that support the core mission and aligns resources with specific goals. Each GPRA Unit has completed or will complete a Program Assessment Rating Tool (PART). A unique program goal was developed for each GPRA unit. A numbering scheme has been established for tracking performance and reporting.

The goal cascade accomplishes two things. First, it ties major activities for each program to successive goals and, ultimately, to DOE's mission. This helps ensure the Department focuses its resources on fulfilling its mission. Second, the cascade allows DOE to track progress against quantifiable goals and to tie resources to each goal at any level in the cascade. Thus, the cascade facilitates the integration of budget and performance information in support of the GPRA and the President's Management Agenda (PMA).

Another important component of our strategic planning—and the President's Management Agenda—is use of the Administration's R&D investment criteria to plan and assess programs and projects. The criteria were developed in 2001 and further refined with input from agencies, Congressional staff, the National Academy of Sciences, and numerous private sector and nonprofit stakeholders.

The chief elements of the R&D investment criteria are quality, relevance, and performance. Programs must demonstrate fulfillment of these elements. For example, to demonstrate relevance, programs are expected to have complete plans with clear goals and priorities. To demonstrate quality, programs are expected to commission periodic independent expert reviews. There are several other requirements, many of which R&D programs have and continue to undertake.

An additional set of criteria were established for R&D programs developing technologies that address industry issues. Some key elements of the criteria include: the ability of the programs to articulate the appropriateness and need for Federal assistance; relevance to the industry and the marketplace; identification of a transition point to industry commercialization (or of an off-ramp if progress does not meet expectations); and the potential public benefits, compared to alternative investments, that may accrue if the technology is successfully deployed.

The OMB-OSTP guidance memo to agencies dated August 12, 2004, describes the R&D investment criteria fully and identifies steps agencies should take to fulfill them. (The memo is available on line at http://www.ostp.gov/html/m04-23.pdf.) Where appropriate throughout these justification materials specific R&D investment criteria and requirements are cited to explain the Department's allocation of resources.

Mission

SC's mission is to deliver the discoveries and scientific tools that transform our understanding of energy and matter and advance the national, economic, and energy security of the United States.

Benefits

SC represents an investment in our Nation's future. By providing support for key scientific disciplines, critical scientific tools, and the scientific workforce of today and tomorrow, we help to provide the foundation of our high-tech economy. The National Academies have stated that nearly half of all economic growth comes from investments in research. SC uses the principles of peer review, competition, transparency, and community involvement to guide our investments toward the most promising areas of science. We also look toward the future—not simply joining the latest trends but identifying emerging opportunities and pushing the limits of today's technology.

Our Strategic Plan and "Facilities for the Future of Science" 20-year outlook set an ambitious and clear agenda for scientific discovery over the next decade that reflects national priorities, the missions of the Department, and the views of the U.S. scientific community. Many of the fields we support count experiment time in years or even decades. In these areas, clear, consistent support is a key to success. Other areas change so rapidly that key publications are maintained electronically to keep pace. Flexibility is critical in these areas. Publishing long-range plans and priorities and implementing these through our annual budget request allows us to keep our research agenda clear and consistent while also being responsive to the changing opportunities at the forefront of research.

SC has proven its ability to deliver results over the past 50 years. That legacy includes 70 Nobel Laureates since 1954. Our science has spawned entire new industries, including nuclear medicine technologies that save thousands of lives each year, and the nuclear power industry that now contributes 20% of the power to our Nation's electricity grid. It has also changed the way we see the universe and ourselves; for example—by identifying the ubiquitous and mysterious "dark energy" that is accelerating the expansion of the universe and by sequencing the human genome. SC has taken the lead on new research challenges, such as bringing the power of terascale computing for scientific discovery and industrial competitiveness.

Strategic, General, and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Science appropriation supports the following goal:

Science Strategic Goal: To protect our national and economic security by providing world-class scientific research capacity and advancing scientific knowledge.

General Goal 5, World-Class Scientific Research Capacity: Provide world-class scientific research capacity needed to: ensure the success of Department missions in national and energy security; advance the frontiers of knowledge in physical sciences and areas of biological, medical, environmental, and computational sciences; or provide world-class research facilities for the Nation's science enterprise.

The programs funded by the Science appropriation have the following six Program Goals which contribute to General Goal 5 in the "goal cascade":

Program Goal 05.24.00.00: Bring the Power of the Stars to Earth—Answer the key scientific questions and overcome enormous technical challenges to harness the power that fuels our sun.

Program Goal 05.19.00.00: Explore the Fundamental Interactions of Energy, Matter, Time, and Space—Understand the unification of fundamental particles and forces and the mysterious forms of unseen energy and matter that dominate the universe, search for possible new dimensions of space, and investigate the nature of time itself.

Program Goal 05.20.00.00: Explore Nuclear Matter, from Quarks to Stars—Understand the evolution and structure of nuclear matter, from the smallest building blocks, quarks, and gluons; to the stable elements in the Universe created by stars; to unique isotopes created in the laboratory that exist at the limits of stability and possess radically different properties from known matter.

Program Goal 05.21.00.00: Harness the Power of Our Living World—Provide the biological and environmental discoveries necessary to clean and protect our environment, offer new energy alternatives, and fundamentally change the nature of medical care to improve human health.

Program Goal 05.22.00.00: Advance the Basic Science for Energy Independence—Provide the scientific knowledge and tools to achieve energy independence, securing U.S. leadership and essential breakthroughs in basic energy sciences.

Program Goal 05.23.00.00: Deliver Computing for Accelerated Progress in Science—Deliver forefront computational and networking capabilities to scientists nationwide that enable them to extend the frontiers of science, answering critical questions that range from the function of living cells to the power of fusion energy.

Contribution to General Goals

Six of the programs within the Science appropriation directly contribute to General Goal 5 as follows:

ASCR program contributes to General Goal 5 by significantly advancing scientific simulation and computation; applying new approaches, algorithms, and software and hardware combinations to address the critical science challenges of the future; by providing access to world-class scientific computation and networking facilities to the Nation's scientific community to support advancements in practically every field of science and industry; and by providing platforms for virtual prototypes to enhance economic competitiveness for U.S. industry. ASCR will continue to advance the transformation of scientific simulation and computation into the third pillar of scientific discovery, enabling scientists to look inside an atom or across a galaxy; and inside a chemical reaction that takes a millionth of a billionth of a second or across a climate change process that lasts for a thousand years. In addition, ASCR will shrink the distance between scientists and the resources—experiments, data, and other scientists—they need, and accelerate scientific discovery by taking simulation times from years to days to hours.

BES contributes to General Goal 5 by advancing nanoscale science through atomic- and molecular-level studies in materials sciences and engineering, chemistry, geosciences, and energy biosciences. BES also provides the Nation's researchers with world-class research facilities, including reactor and accelerator-based neutron sources, light sources including the X-ray free electron laser currently under construction, and micro-characterization centers. These facilities provide outstanding capabilities for imaging and characterizing materials of all kinds from metals, alloys, and ceramics to fragile biological samples. The next steps in the characterization and the ultimate control of materials properties and chemical reactivity are to improve spatial resolution of imaging techniques; to enable a wide variety of samples, sample sizes, and sample environments to be used in imaging experiments; and to make measurements on very short time scales, comparable to the time of a chemical reaction or the formation of a chemical bond. With these tools, we will be able to understand how the composition of materials affects their properties, to watch proteins fold, to see chemical reactions, and to understand and observe the nature of the chemical bond. Theory, modeling, and computer simulations will also play a major role in achieving these outcomes and will be a companion to experimental work. BES is also implementing the opportunities contained in the study “Basic Research Needs to Assure a Secure Energy Future.” A first example is the support of basic research aimed at advancing hydrogen production, storage, and use for the coming hydrogen economy. A second is an assessment of the basic research needs for effective solar energy conversion to electricity or fuels.

BER contributes to General Goal 5 by advancing energy-related biological and environmental research in genomics and our understanding of complete biological systems, such as microbes that produce hydrogen; by developing models to predict climate over decades to centuries; by developing science-based methods for cleaning up environmental contaminants; by providing regulators with a stronger scientific basis for developing future radiation protection standards; and by conducting limited research in medical imaging, including radiopharmaceuticals.

FES contributes to General Goal 5 by advancing the theoretical and experimental understanding of plasma and fusion science, including a close collaboration with international partners in identifying and exploring plasma and fusion physics issues through specialized facilities. This includes: 1) exploring basic issues in plasma science; 2) developing the scientific basis and computational tools to predict the behavior of magnetically confined plasmas; 3) using the advances in tokamak research to enable the initiation of the burning plasma physics phase of the FES program; 4) exploring innovative confinement options that offer the potential of more attractive fusion energy sources in the long term; 5) focusing on the scientific issues of nonneutral plasma physics and High Energy Density Physics; and 6) developing the cutting edge technologies that enable fusion facilities to achieve their scientific goals. The research capabilities are essential to the construction and operation of ITER; described below. FES also contributes to General Goal 5 through participation in ITER, an experiment to study and demonstrate the sustained burning of fusion fuel. This proposed international collaboration will provide an unparalleled scientific research opportunity with a goal of demonstrating the scientific and technical feasibility of fusion power. ITER is a multi-billion dollar international research project that will, if successful, advance progress towards developing fusion’s potential as a commercially viable and clean source of energy near the middle of the century.

The FY 2006 Budget provides for the start in mid-FY 2006 of a Major Item of Equipment (MIE) project entitled “U.S. Contributions to ITER.” This title draws distinction between the international ITER project, in which the U.S. will be one of many participating parties, and the MIE, for which the U.S. has specific responsibilities. The Total Project Cost, including Total Estimated Cost (TEC) and Other Project Costs (OPC), for the U.S. Contributions to ITER MIE is provided in detail in the budget for the FES program.

HEP contributes to General Goal 5 by advancing understanding of the basic constituents of matter, dark energy and dark matter, the lack of symmetry between matter and antimatter in the current universe, and the possible existence of other dimensions, collectively revealing key secrets of the universe. HEP expands the energy frontier with particle accelerators to study fundamental interactions at the highest possible energies, which may reveal new particles, new forces, or undiscovered dimensions of space and time; explain the origin of mass; and illuminate the pathway to the underlying simplicity of the universe. At the same time, the HEP program sheds new light on other mysteries of the cosmos, uncovering what holds galaxies together and what is pushing the universe apart; understanding why there is any matter in the universe at all; and exposing how the tiniest constituents of the universe may have the largest role in shaping its birth, growth, and ultimate fate.

NP contributes to General Goal 5 by supporting innovative, peer- reviewed scientific research to advance knowledge and provide insights into the nature of energy and matter, and, in particular, to investigate the fundamental forces that hold the nucleus together and determine the detailed structure and behavior of the atomic nuclei. The program builds and operates world-leading scientific facilities and state-of-the-art instrumentation to study the evolution and structure of nuclear matter, from the smallest building blocks, quarks and gluons, to the stable elements in the Universe created by stars; to understand how the quarks and gluons combine to form the nucleons (proton and neutron), what the properties and behavior are of nuclear matter under extreme conditions of temperature and pressure, and what the properties and reaction rates are for atomic nuclei up to their limits of stability. Results and insight from these studies are relevant to understanding how the universe evolved in it earliest moments, how the chemical elements were formed, and how the properties of one of nature's basic constituents, the neutrino, influences astrophysics phenomena such as supernovae. Scientific discoveries at the frontiers of nuclear physics further the nation's energy-related research capacity, in turn providing for the nation's security, economic growth and opportunities, and improved quality of life.

Funding by General and Program Goal

	(dollars in thousands)		
	FY 2004	FY 2005	FY 2006
General Goal 5, World-Class Scientific Research Capacity			
Program Goal 05.19.00.00, High Energy Physics	716,170	736,444	713,933
Program Goal 05.20.00.00, Nuclear Physics	379,792	404,778	370,741
Program Goal 05.21.00.00, Biological and Environmental Research	624,048	581,912	455,688
Program Goal 05.22.00.00, Basic Energy Sciences	991,262	1,104,632	1,146,017
Program Goal 05.23.00.00, Advanced Scientific Computing Research	196,795	232,468	207,055
Program Goal 05.24.00.00, Fusion Energy Sciences	255,859	273,903	290,550
Subtotal, General Goal 5, World-Class Scientific Research Capacity	3,163,926	3,334,137	3,183,984
All Other			
Science Laboratories Infrastructure	55,266	41,998	40,105
Program Direction	150,277	153,706	162,725
Workforce Development for Teachers and Scientists	6,432	7,599	7,192
Safeguards and Security	62,328	72,773	74,317
Small Business Innovation Research/Small Business Technology Transfer	114,915	0	0
Total, All Other	389,218	276,076	284,339
Total, General Goal 5 (Science)	3,553,144	3,610,213	3,468,323

Major FY 2004 Accomplishments

The 2003 Nobel Prize for Physics was shared by an Argonne National Laboratory researcher for pioneering contributions to the theory of superconductors. SC has long supported this work on the mechanisms of high temperature superconductivity. Amongst the myriad applications of superconducting materials are the magnets used for magnetic resonance imaging, or MRI, and potential applications in high efficiency electricity transmission and high-speed trains.

The 2004 Nobel Prize in Physics was awarded to three researchers (from MIT, University of California at Santa Barbara, and Caltech) for their discovery of "asymptotic freedom" in the theory of strong interactions, Quantum ChromoDynamics (QCD). This is the force that holds protons together. Their theoretical work was decisive in understanding one of Nature's fundamental forces and made it possible to complete the Standard Model of Particle Physics, the model that describes the smallest objects in Nature and how they interact. Two of the three researchers have been supported by the HEP program for many years.

In 2004, the Relativistic Heavy Ion Collider (RHIC) at the Brookhaven National Laboratory (BNL) delivered gold beams at twice the accelerator design limits and greatly exceeded the expectations of the 1,000-plus international physicists working on the four experiments at RHIC. The goal of RHIC is to recreate the predicted quark-gluon plasma, an extremely dense state of matter thought to have last existed microseconds after the Big Bang. The RHIC data have revealed evidence of a new state of matter, however, with properties which indicate that it is strongly interacting – something new and unexpected – as well as possible evidence of another state of matter, called the "color glass condensate."

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by the Office of Management and Budget (OMB) to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews.

The current focus is to establish outcome- and output-oriented goals, the successful completion of which will lead to benefits to the public, such as increased national security and energy security, and improved environmental conditions. DOE has incorporated feedback from OMB into the FY 2006 Budget Request, and the Department will take the necessary steps to continue to improve performance.

SC did not complete PARTs for the FY 2006 Budget. In the FY 2005 PART review, OMB assessed six SC programs: ASCR, BES, BER, FES, HEP, and NP. Program scores ranged from 82-93%. Three programs—BES, BER, and NP—were assessed "Effective." Three programs—ASCR, FES, and HEP—were assessed "Moderately Effective." The full PARTs are available on the OMB website at http://www.whitehouse.gov/omb/budget/fy2005/part.html.

A Committee of Visitors (COV) is a panel of outside experts who review a program's portfolio for quality and consistent application of business practices. Based on the success of the COV formed by the BES program, and as subsequently recommended by OMB in the FY 2005 PART findings, SC has established COVs for all six research programs. Each of these COVs conducted at least one review by the end of FY 2004. These COVs have been formed under the auspices of the programs' Scientific Advisory Committees. Charge letters and reports for the COVs are on the SC website at http://www.science.doe.gov/measures/cov.html.

In addition, SC has taken steps to enhance public understanding of our revised performance measures. A PART website (http://www.science.doe.gov/measures/) has been developed to better explain what each scientific measure means, why it is important to the Department and/or the research community, and how progress will be measured. Roadmaps with more detailed information on tracking progress toward the long-term measures have been developed with the Scientific Advisory Committees and will be posted to this PART website. The Advisory Committees will review progress toward those measures vis-à-vis the roadmaps every 3 to 5 years. The first reviews will be conducted in FY 2007. The results of these reviews will be published on the PART website as they become available.

Significant Program Shifts

SC is ready to meet the challenges of today. We have established clear research priorities for the present and for the next decade. We have identified the key research facilities our Nation needs to build to maintain scientific excellence. We will restructure our workforce and our business practices to achieve greater efficiencies and economies of scale that will improve the performance of the 10 national laboratories that we manage. This budget request fully supports the SC workforce. Tough decisions have been made, but we are confident that the investments we propose are among the very best that science has to offer and are sound investments in our Nation’s future.

In keeping with the R&D Investment Criteria’s commitment to excellence through peer reviewed competition, ASCR will recompete major elements of its portfolio related to Scientific Discovery through Advanced Computing (SciDAC) in FY 2006, with attention paid to support for the long-term maintenance and support of software tools such as mathematical libraries, adaptive mesh refinement software, and scientific data management tools developed in the first 5 years of the effort. In addition, in FY 2006, ASCR is changing the way in which it manages its Genomics: GTL partnership with BER. The management of these efforts will be integrated into the portfolio of successful SciDAC partnerships. The FY 2006 budget request includes $7,500,000 for continued support of the Genomics: GTL research program, in partnership with BER; $2,600,000 for the Nanoscale Science, Engineering and Technology initiative led by the BES program; $1,350,000 for support of the Fusion Simulation Project, led by the FES program; and $8,500,000 to continue “Atomic to Macroscopic Mathematics” research support in applied mathematics needed to break through the current barriers in our understanding of complex physics processes that occur on a wide range of interacting length- and time-scales. Finally, in FY 2006 ASCR will initiate a small number of competitively selected SciDAC institutes at universities which can become centers of excellence in high end computational science in areas that are critical to DOE missions at a total funding level of $8,000,000. In keeping with the principles of the PART, the research effort in Collaboratory Tools and Pilots and Networking will be restructured into an integrated Distributed Network Environment activity focused on basic research in computer networks and the middleware needed to make these networks tools for science. The efficiencies achieved through this restructuring will enable the Next Generation Architecture (NGA) effort to operate computers, such as the 20 teraflop Cray X1e and Cray Red Storm system acquired in FY 2004 and FY 2005 at the Center for Computational Sciences (CCS) at the Oak Ridge National Laboratory (ORNL), as tools for science and especially to satisfy the demand for resources that has resulted from the successful SciDAC efforts. In addition, the NGA activity initiates a new competition for Research and Evaluation (R&E) prototype computer testbeds to enable SciDAC teams to evaluate the potential of future architectures. NGA will continue its focus on research in operating systems and systems software. These efforts are aligned with the plan developed by the National Science and Technology Council (NSTC). These efforts will play a critical role in enabling Leadership Class Machines that could lead to solutions for scientific and industrial problems beyond what would be attainable through a continued simple extrapolation of current computational capabilities. This area has been identified as a priority within the overall Networking and Information Technology Research and Development (NITR&D) priorities of the

Administration. Core funding for university and national laboratory researchers decreases 11.9% compared to the FY 2005 appropriation.

In BES, FY 2006 marks the completion of construction and the initial operation of the Spallation Neutron Source. Operations will also begin at four of the five Nanoscale Science Research Centers (NSRCs) with the exception being the Center for Functional Nanomaterials at BNL, which is scheduled to begin operations in FY 2008. NSRCs are user facilities for the synthesis, processing, fabrication, and analysis of materials at the nanoscale. The NSRCs are designed to promote rapid advances in the various areas of nanoscale science and technology and are part of the DOE contribution to the National Nanotechnology Initiative. The Linac Coherent Light Source (LCLS) will continue Project Engineering Design (PED) and will begin construction at the planned levels. Funding will be provided separately for preconceptual design of instruments for the facility. Funding will also be provided to partially support operation of the Stanford Linear Accelerator Center (SLAC) linac. This will mark the beginning of the transition to LCLS operations at SLAC. This new facility will open entirely new realms of discovery in the chemical, materials, and biological sciences. Pioneering developments of aberration-correcting electron optics have created the unprecedented opportunity to directly observe the atomic-scale order, electronic structure, and dynamics of individual nanoscale structures by advanced transmission electron microscopy. The FY 2006 budget supports an MIE for the Transmission Electron Aberration-corrected Microscope (TEAM). All BES construction projects are reviewed and monitored via an R&D Investment Criteria best practice for performance. To maintain progress toward a PART long-term goal, research to realize the potential of a hydrogen economy will be increased from $29,183,000 to $32,500,000. This research program is based on the BES workshop report Basic Research Needs for the Hydrogen Economy. Operations at the Radiochemical Engineering and Development Center at ORNL will be terminated. The operations budgets of the remaining facilities will be at about the same level as in FY 2005, decreasing available beam time and service for users. Core funding for university and national laboratory researchers decreases 7.8% compared to the FY 2005 appropriation. While no research activities will be terminated, there will be reductions throughout.

BER is investigating the potential for a new generation of sophisticated high-throughput genomics technologies, making them widely and readily available, and using them effectively to serve the community of national laboratories, and academic and industrial researchers. In keeping with the relevance principles in the R&D Investment Criteria, the Biological and Environmental Research Advisory Committee (BERAC) has confirmed that these Genomics: GTL facilities are highly relevant to the mission of BER and the goals of the research community. A high-level National Academies Study will be commissioned in FY 2005 to assess the scientific case for the Genomics: GTL effort as it relates to DOE core missions. Research to underpin the development and design of the technologies to be incorporated into the proposed Genomics: GTL Facility for the Production and Characterization of Proteins and Molecular Tags is currently being funded as part of the Genomics: GTL program. The Ethical, Legal, and Societal Issues program will include activities applicable to biotechnology and nanotechnology in cooperation with other SC programs. Moving the management of the National Institute for Global Environmental Change (NIGEC) from the University of California at Davis to BER will increase performance by reducing overhead costs and freeing up funds to support additional research that is highly relevant to DOE missions. This action has been confirmed by the BERAC COV, called for in the PART, for the Climate Change Research program. The number of NIGEC regional centers will also be reduced from six to four by holding an open competition for the four centers in keeping with the excellence principles of the R&D Investment Criteria. Based on their relevance to the BER long-term goals and higher BER priorities, funding reductions are initiated in the Medical Applications and Measurement Science Research subprogram which is refocused on advanced medical imaging technology, including radiopharmaceuticals for imaging, and on the Artificial Retina. Based on the BERAC COV findings for the Environmental Remediation Research subprogram, the research activities are integrated into a single program to increase the efficiency of the activities and better address the BER long-term goals in environmental remediation research. Core funding for university and national laboratory researchers decreases 10.2% compared to the FY 2005 appropriation.

In FES, the FY 2006 budget continues the redirection of the fusion program to prepare for and participate in the ITER program—an initiative taken at Presidential direction. Operation of the three major fusion research facilities will be reduced from a total of 48 weeks to 17 weeks. The TEC for the National Compact Stellarator Experiment (NCSX) increases. Other program shifts include reduction of the Inertial Fusion Energy/High Energy Density Physics program from the FY 2005 level. In addition, the Materials Research program will be eliminated in favor of reliance upon the general BES materials effort for U.S. scientific advances in areas of fusion interest. Overall, core funding for university, industry, and national laboratory researchers decreases by 12.8% compared to the FY 2005 appropriation. The FY 2006 request for the U.S. Contributions to ITER MIE is summarized in the following table.

U.S. Contributions to ITER
Annual Profile

(budget authority in thousands)

Fiscal Year	Total Estimated Cost	Other Project Costs	Total Project Cost
2006	46,000	3,500	49,500
2007	130,000	16,000	146,000
2008	182,000	18,800	200,800
2009	191,000	16,500	207,500
2010	189,000	10,300	199,300
2011	151,000	9,300	160,300
2012	120,000	6,200	126,200
2013	29,000	3,400	32,400
Total	1,038,000	84,000	1,122,000

Because of its broad relevance in addressing many of the long-term goals of HEP, and its unique potential for new discoveries, the highest priority is given to the planned operations for the Tevatron program at Fermi National Accelerator Laboratory, including fully funded upgrades and infrastructure support. To fully exploit the unique opportunity to expand our understanding of the asymmetry of matter and anti-matter in the universe, a high priority is given to the operations for the B-factory at SLAC, including an allowance for increased power costs, associated upgrades, and infrastructure support. With its great potential for discoveries, such as understanding of the origin of mass, support of a leadership role for U.S. research groups in the Large Hadron Collider (LHC) physics program will be a high priority. As the LHC accelerator in Geneva, Switzerland nears its turn-on, U.S. activities related to fabrication of detector and accelerator components will be completed and new activities related to commissioning, pre-operations, and software and computing will ramp-up significantly. Given the schedule and funding constraints, the BTeV ("B Physics at the Tevatron") experiment, which was planned in FY 2005 as a new MIE, will be terminated by end of FY 2005. This is consistent with the guidance of the High Energy Physics Advisory Panel (HEPAP), which supported BTeV, but only if it could be completed by FY 2010. To explore the nature of dark energy, R&D for potential interagency experiments with the National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA) will continue in FY 2006. To address the opportunity for significant new future research options, R&D in support of an international electron-positron linear collider is increased. To provide a nearer-term future program, and preserve future research options, R&D for other new accelerator and detector technologies, particularly in the emerging area of neutrino physics, will increase in FY 2006. Core funding for university and national laboratory researchers is about the same as the FY 2005 appropriation.

In NP, the FY 2006 budget request maintains the scientific scope of the nation's nuclear physics program. In keeping with PART findings and principles, termination of operations of the MIT/Bates facility in FY 2005 will allow resources for the remaining user facilities: the RHIC at BNL, the Continuous Electron Beam Accelerator Facility (CEBAF) at the Thomas Jefferson National Accelerator Laboratory (TJNAF), and the Argonne Tandem Linear Accelerator System (ATLAS) and Holifield Radioactive Ion Beam Facility (HRIBF) at ORNL. Operations at these facilities will be at about 65% of optimum utilization. Investments are made in capabilities at these facilities to extract the desired science and to improve efficiencies in the outyears. The R&D Investment Criteria's relevance principles recommend utilizing community planning in establishing program priorities. FY 2006 funding for capital equipment will address opportunities identified in the 2002 Nuclear Science Advisory Committee (NSAC) Long Range Plan and subsequent NSAC recommendations. At RHIC, funding is provided for needed detector upgrades, redirecting modest funds available for operations of the facility and existing detectors. At TJNAF, funding is provided for 12 GeV CEBAF Upgrade R&D and conceptual design activities. At ATLAS and HRIBF, the priority is on emphasizing facility operations within available funds. The research programs at the major user facilities are integrated partnerships between DOE scientific laboratories and the university community, and the planned experimental research activities are considered essential for scientific productivity of the facilities. Core funding for university and national laboratory researchers decreases 9.3% compared to the FY 2005 appropriation. R&D activities for the proposed Rare Isotope Accelerator (RIA) are maintained at the FY 2005 Presidential Request level.

The purpose of the S&S program is to ensure appropriate levels of protection against unauthorized access, theft, diversion, loss of custody or destruction of DOE assets, and hostile acts that may cause adverse impacts on fundamental science, national security, or the health and safety of DOE and contractor employees, the public, or the environment. In FY 2006, small increases in funding are primarily for security systems for reconfiguration and improvements of entry points at BNL and SLAC and for revised Design Basis Threat needs primarily at ORNL.

The SLI mission is to enable the conduct of Departmental research missions at the ten SC laboratories and the Oak Ridge Institute for Science and Education (ORISE) by funding line item construction to maintain the general purpose infrastructure and the clean-up and removal of excess facilities. The program also supports SC landlord responsibilities for the 34,000 acre Oak Ridge Reservation; provides Payment in Lieu of Taxes (PILT); and provides for the correction of Occupational Safety and Health Administration (OSHA) and Nuclear Regulatory Commission identified deficiencies and implementation of recommendations for improved health and safety practices at SC laboratories. In FY 2006, the SLI program will initiate the clean-up and removal of the retired Bevatron accelerator at the Lawrence Berkeley National Laboratory.

The SCPD mission is to provide a Federal workforce, skilled and highly motivated, to manage and support basic energy and science-related research disciplines, diversely supported through research programs, projects, and facilities under the SC's leadership. Rollout of Phase 1 of the SC restructuring initiative (OneSC) was announced in March 2004. The new SC structure improves organizational and functional alignment, reporting relationships (by reducing layers of management), streamlining decision-making processes, clarifying lines of authority, and making better use of resources. Phase 2 of OneSC will occur over the next 24 months and involves human capital and organizational analyses and reengineering of SC business and management operations and processes. This phase will optimize SC business practices, take unnecessary work out of the system, enable the federal workforce to be more productive, support improved laboratory contractor performance, and ultimately drive down the cost of doing business in both federal and contractor operations. This project embraces the changes envisioned by the PMA to manage government programs more economically and effectively.

WDTS will run Laboratory Science Teacher Professional Development (LSTPD) activities at five or more DOE national laboratories with about 105 participating teachers, in response to the national need for science teachers who have strong content knowledge in the classes they teach. FY 2006 represents the third year of this program and 15 new teachers will be supported, in addition to the 90 teachers already part-way through this 3-year program. The Faculty Sabbatical activity, which begins in FY 2005 for 12 faculty members from Minority Serving Institutions, will have 5 positions available in FY 2006. The Pre-Service Teachers activity will be run at one national laboratory, and students will be recruited from participating NSF programs. On July 8, 2004, DOE announced the STARS education initiative to promote science literacy and help develop the next generation of scientists and engineers. In support of this effort, there is additional funding to both the LSTPD activity and to the Middle School Science Bowl. The components of the STARS that involve educational outreach by national laboratory scientists and engineers to middle school students will be executed by the national laboratories through their respective workforce development/education offices.

Institutional General Plant Projects

Institutional General Plant Projects (IGPPs) are miscellaneous construction projects that are each less than $5,000,000 in TEC and are of a general nature (cannot be allocated to a specific program). IGPPs support multi-programmatic and/or inter-disciplinary programs and are funded through site overhead. Examples of acceptable IGPPs include site-wide maintenance facilities and utilities, such as roads and grounds out side the plant fences or a telephone switch that serves the entire facility.

Examples of prior year and current year projects are:

- Building 1506 Renovation at ORNL. This FY 2003 and FY 2004 effort included structural upgrades to comply with DOE and international codes; greenhouse replacements; laboratory reconfigurations; and heating, ventilation and air conditioning (HVAC) modifications. TEC: $3,150,000.
- East Campus Entry and Parking design and construction at ORNL. This effort, initiated in FY 2003, includes construction of a new 25,000 square foot parking court for approximately 60 cars and a 20,000 square foot terrace area with seating and informal gathering areas. TEC: $2,467,000.
- Quadrangle Common Area design and construction at ORNL. This FY 2004 and FY 2005 effort includes lawn, landscaping, sidewalks, lighting, and street improvements to an area of approximately 71,000 square feet. TEC: $2,697,000.
- 5000 Area Utility Systems Upgrade at ORNL. This FY 2005 project will provide utility services (i.e., natural gas, potable water, and sanitary sewer) for the East Campus area to support new third party development. TEC: $325,000.
- Horn Rapids Triangle Utilities Infrastructure at the Pacific Northwest National Laboratory. This FY 2005 and FY 2006 project will provide the needed site utility infrastructure to support the

proposed construction of new lab and office facilities to replace 300 Area facilities which will be demolished. Area to be developed is approximately 70 acres. TEC: $3,500,000.

The following displays IGPP funding by site:

(dollars in thousands)

	FY 2004	FY 2005	FY 2006	$ Change	% Change
Oak Ridge National Laboratory	6,000	8,000	8,000	0	0.0%
Pacific Northwest National Laboratory	500	5,000	5,000	0	0.0%
Total, IGPP	6,500	13,000	13,000	0	0.0%

Selected Office of Science Activities

(dollars in thousands)

	FY 2004	FY 2005	FY 2006	$ Change	% Change
Hydrogen Initiative	7,710	29,183	32,500	+3,317	+11.4%
Genomics: GTL	73,177	84,984	94,686	+9,702	+11.4%
Climate Change Science Program	129,328	128,570	132,109	+3,539	+2.8%
High Performance Computing and Communications	213,035	252,932	227,434	-25,498	-10.1%
Nanoscience Engineering and Technology	201,582	210,415	207,481	-2,934	-1.4%
ITER	0	0	49,500	+49,500	--